SCRAM: A Program for the Simulation of
Canadian Renewal Assistance for Mortgages

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Preliminary Draft

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Introduction

The recent period of unusually high nominal interest rates has had unfortunate effects on many parts of the Canadian economy. Among those affected were families that renewed mortgages. In many instances monthly mortgage payments doubled relative to their pre-renewal levels, and some families on already-tight budgets were forced to sell their homes. In consequence, there has been considerable discussion of plans to prevent such occurrences in the future. The particular plan addressed here is one in which mortgage payments in excess of some specified fraction of income (e.g., 30 percent) would be subsidized. In particular, we consider situations in which a subsidy is paid when the gross debt service ratio (the ratio of mortgage payments including property taxes to family income) exceeds some specified value, say G^*.

The future costs of such a program depend on a large number of factors including: the size of the eligible population, the level of G^*, the fraction of payments in excess of G^* to be subsidized, the historical pattern of interest rates and mortgage contracts that have led to the particular structure of outstanding mortgages, the time path of mortgage interest rates over the relevant period, and the rate of growth of income. SCRAM is a computer simulation program designed to forecast the number of mortgage renewals and to assess the costs of providing subsidies under alternative scenarios.

In addition to the factors listed above, there are a large number of behavioural factors that would influence the ultimate cost of a renewal assistance program. The most obvious sources of cost escalation are behavioural responses that would increase the numerator (mortgage payments) or reduce the denominator (family income) of the gross debt service ratio expression. The family might be influenced by the subsidy to purchase a more expensive house with a larger mortgage, to take a larger mortgage for a given house, or to choose a shorter amortization period for the mortgage. The family could also reduce its income near the mortgage renewal date by having fewer of its members in the labour force, or by having them work fewer hours. The shorter the accounting period used to calculate the gross debt to income ratio (e.g., a month as opposed to a year), the easier it would be to arrange for variations in family income to take advantage of the subsidy.[1]

Two other types of behavioural response are also likely to be important in determining the cost of such a scheme. First, there will be an added incentive for families to purchase housing units that they could not afford without the subsidy. To be sure, they will have to manage until their first renewal, at which time they become eligible for the subsidy, but this is not likely to be difficult.[2] Second, one might expect families to want a shorter term on new mortgages since the subsidy would only come into effect at renewal time.[3] Similar reasoning suggests that if eligible families continue to receive a subsidy for the whole of the renewal term, there would be an incentive to negotiate for a long renewal term, especially if the subsidy is 100 percent for mortgage payments in excess of the target gross debt service ratio.

Behavioural responses such as these are no doubt important. However, no attempt has been made to incorporate them directly into the SCRAM program. The SCRAM program should thus be viewed as a rough first guide to the estimation

of the effects of a mortgage renewal subsidy scheme. To the extent that the user has some particular views about behavioural responses, he or she can incorporate these in a crude way by modifying such input data as the distribution of gross debt service ratios for new mortgages, or the distribution of mortgage renewal terms. Such possibilities should become clearer as we describe the data inputs in the sections that follow.

The Simulation Model

We begin with a short overview of the model. The key inputs[4] to the model are: the number of new mortgages approved each year between 1970 and 2000 (or the end of the simulation period, if shorter); the proportions of these mortgages of each term (one year, two years, etc.); the average value of a mortgage approved in each year; and the distribution of the gross debt service ratios of families taking out new mortgages. Given these basic inputs, we can calculate the number of mortgages that will be renewed each year in the future, and relate them to the year of origination. For each year of origination, we can then calculate the proportion of the original principal that remains and, given the current interest rate (which is assumed), calculate the mortgage payments at time of renewal relative to the mortgage payments at time of origination. Moreover, given an assumed rate of growth of nominal incomes, we can calculate the proportionate increase in family income (assuming no change in work behaviour). Based on information about how the numerator and denominator in the gross debt service ratio expressions have changed since the year of origination, we can also infer how the whole distribution has moved. Then, for a specified gross debt service ratio for eligibility, we can estimate the number of families whose ratios exceed the criterion for each origination year. Adding these together over the various

origination years gives us the number of mortgages that will become eligible for subsidy each year. With this plus additional information on the average income of the eligible population and the characteristics of the subsidy plan (e.g., 100 percent of payments in excess of the eligibility criterion will be subsidized), one can infer the dollar amount of the subsidy involved. This, then, is a rough sketch of how the model works.

We turn now to discuss the model in detail. It is convenient to start by considering the data inputs which the model requires.

The matrix A(s,a) has as its elements, new loans approved each year (indexed s) from 1970 to the final year by various amortization periods (indexed a). In practice, we have assumed all mortgages have 20, 25, 30, or 35 year amortization periods, though in principle, any number of amortization periods could be handled. Data for the years 1970 to 1982 are historical, while 1983 and later years are forecasts. As the model is now set up, the forecast number of new approvals depends on the interest rate. The forecast rules were provided by C.M.H.C. and are reported in Table 1 along with the historical data. The reader will note that the historical estimates and the forecasts refer to NHA and conventional new and existing institutional loan approvals. If the subsidy plan were to extend to other mortgage issuers, adjustments would have to be made for the results of this program to be meaningful.[5] In addition, the reader will note that data are provided for Canada and the five regions. All calculations in the model are for each of the five regions and for Canada (treated as a region). For ease of presentation we do not introduce a separate subscript for region. In many instances we are forced to use the same assumptions for the regions as for Canada. We will make clear as we proceed which data are region specific.

The second major input is the distribution of mortgage terms. In fact, it is clear that the terms of renewal mortgages differ from those of new mortgages. We therefore define two matrices -- P(t,r) for new mortgages, and $\bar{P}(t,r)$ for renewals. Each has as its rows the years, starting from 1970, and as its columns the renewal periods (r=1,...,35). Thus, $\bar{P}(1978,3)$ is the proportion of mortgages that are renewed in 1978 with a three year term. We do not have separate information on these variables for each region. Forecasts on both P and $\bar{P}$ are conditional on the rate of interest. The historical data and forecasts are provided in Table 2. (Table 2 shows all new mortgage approvals and mortgage renewals as having either 1, 3, or 5 year terms or fixed terms. In practice, fixed terms are treated as 25 years.)

The third major input concerns the distribution of gross debt service ratios for new mortgages. The raw data for 1981 are reported in Table 3. From these raw data we define G_i, i=.01,.02,.....,.99,1.00, such that $F(G_i) = i$ where F refers to the cumulative distribution. Thus, for example, G_i for i = .10,.20, etc. refer to the values of the gross debt service ratio that divide the distribution into deciles. It is this form of the distribution that we work with later on.

The average family income for NHA borrowers for new housing was provided by C.M.H.C. for all Canada for the period 1970 to 1981. Figures for the regions were derived, based on the assumption that the ratio of average family income in each region to the Canada average is the same as the corresponding ratio of personal income per adult (persons aged 20 and over). The 1982 values were calculated on the assumption that incomes in all regions grew by 8.3 percent (the growth rate for Canada for 1981-82). Figures are reported in Table 4.

The value of the average mortgage is also required. Regional data were available only from 1975 to 1981 (see Table 5), but the series for the regions were projected back to 1970 using the rate of change of the Canada series. For 1982, average mortgage values for Canada and all the regions were assumed to increase by 8.3 percent, the same growth rate used in Table 4. Projections are based on the inflation rate assumed by the user. These average mortgage values will be part of the V matrix defined below.

Tables 6 and 7 provide additional input data that are used in the calculations. Table 6 reports information on mortgage "mortality". That is, information on the proportions of a 25-year mortgage that are "retired" at various "ages". The frequencies for mortgages of other amortization periods are assumed to be the same. That is, we assume 80.3 percent of 20-year mortgages are retired by year 19 and 100 percent by year 20, while 100 percent of 30-year mortgages are retired by year 25. Mortgages can be repaid early for a variety of reasons. The most common of these would be the sale of the house to someone who does not wish to assume the mortgage. In addition, some families will choose to repay the mortgage early, some houses will be destroyed and the insurance money used to repay the mortgage, and so on. In any event, all causes are assumed to be accounted for here. From this information we calculate a "life table" for mortgages of each amortization period. Thus, $\delta(a,k)$ is the proportion of mortgages of amortization period a, that are still "alive" after k periods.

Table 7 records information on property taxes as a percent of personal income in Canada and the regions. We define the ratio by the symbol τ. Taxes are included in the numerator of the gross debt service ratio calculation, and must be removed to get the distribution of the ratio of mortgage payments net of such taxes to personal income.

Table 8 provides historical information on the distribution of amortization periods of new NHA mortgages (a subset of NHA plus conventional). No information is available by region, and we assume the same distribution in all cases. The future distribution is held constant at 1982 values and the 1970 distribution is set equal to the 1971 distribution.

Finally, the conventional mortgage lending rates for the period 1970-82 are recorded in Table 9. The rates are, in fact, averages of monthly rates.

We turn now to a discussion of the output calculated by the model.

We first calculate the number of renewals at time t. Let $R(s,t,a)$ be an array whose elements are the number of renewals at time t of mortgages that originated at time s with amortization period a. This is perhaps best thought of as a set of two dimensional arrays for each amortization period with the rows being the calendar years of mortgage origination and the columns the years of renewal. This would be an upper diagonal matrix with the first three elements of the first row as shown below.

$$R(1970,1970,a) = 0$$

$$R(1970,1971,a) = \delta(a,1)\cdot P(1970,1)\cdot A(1970,a)$$

$$R(1970,1972,a) = \delta(a,2)\cdot[P(1970,2)\cdot A(1970,a) + \bar{P}(1971,1)\cdot R(1970,1971,a)/\delta(a,1)].$$

The general term in the R matrix is constructed as:

$$R(s,t,a) = \delta(a,t-s)\cdot\Big[P(s,t-s)\cdot A(s,a) + \bar{P}(s+1,t-s-1)\cdot R(s,s+1,a)/\delta(a,1) + \bar{P}(s+2,t-s-2)\cdot R(s,s+2,a)/\delta(a,2) + \cdots + \bar{P}(t-1,1)\cdot R(s,t-1,a)/\delta(a,t-s-1)\Big]$$

Using this recursive algorithm, all elements of the R arrays can be found.

The next series of steps involve mortgage calculations. Let V(s,t,a) be the mortgage principal outstanding at time t for a mortgage approved at time s of amortization period a. Similarly, let M(s,t,a) be the annual mortgage payment at time t associated with a mortgage of value V(s,t,a). Let $\rho(t)$ be the effective monthly interest rate. That is, $\rho(t)$ is defined as:

$$\rho(t) = \left[1 + \frac{r(t)}{2}\right]^{1/6} - 1,$$

where r(t) is the quoted annual mortgage interest rate, with semi-annual compounding. Given $\rho(t)$ and the outstanding principal (V) for a mortgage to be renewed, the value of M can be calculated, based on a standard mortgage formula, as:

$$(1) \qquad M(s,t,a) = 12 \cdot \left[\frac{\rho(t)\cdot(1+\rho(t))^{12(a-t+s)}}{(1+\rho(t))^{12(a-t+s)}-1}\right] \cdot V(s,t,a).$$

To calculate the elements of V, we use the following formula:

$$(2) \qquad V(s,t,a) = \left\{ \left[1+\bar{\rho}(s,t)\right]^{12(t-s)} - \left[\frac{\bar{P}(s,t)\cdot[1+\bar{\rho}(s,t)]^{12a}}{[1+\bar{\rho}(s,t)]^{12a}-1}\right] \cdot \left[\frac{[1+\bar{\rho}(s,t)]^{12(t-s)}-1}{\bar{\rho}(s,t)}\right] \right\} \cdot V(s,s,a)$$

Equation 2 is the formula for the principal outstanding on a mortgage t-s years after origination, given that payments have been made for t-s years and that the mortgage interest rate as $\bar{\rho}(s,t)$. V(s,s,a) refers to the origination date value of the mortgage; in the SCRAM model it takes on the values shown in Table 4 (it is assumed not to vary with a).

In fact, a mortgage that has been outstanding for, say 7 years, could have been renewed once, twice, or up to six times -- all at potentially different interest rates. It is necessary to make some assumption about $\bar{\rho}$ and we provide four alternatives in the simulation program. These four options are defined as follows:

$$(3) \qquad \bar{\rho}(s,t) = \left\{ \prod_{k=0}^{t-s-1} \left[1+\rho(s+k) \right] \right\}^{\frac{1}{t-s}} - 1$$

$$(4) \qquad \bar{\rho}(s,t) = \max \rho(k) \text{ for } k=s,s+1,s+2,\ldots,t-1$$

$$(5) \qquad \bar{\rho}(s,t) = \min \rho(k) \text{ for } k=s,s+1,s+2,\ldots,t-1$$

$$(6) \qquad \bar{\rho}(s,t) = \rho(s)$$

Equation (3) defines $\bar{\rho}(s,t)$ to be a geometric average of the rates that have prevailed between periods s and t. Equation (4) defines $\bar{\rho}(s,t)$ as the maximum rate and equation (5) as the minimum rate that held between s and t. Finally, equation (6) defines $\bar{\rho}(s,t)$ as the current rate at time s. We chose the first of these to be the standard for use in SCRAM.

Define next the array G(s,t,a) as follows:

$$(7) \qquad G(s,t,a) = M(s,t,a)/Y(t) + \tau$$

G(s,t,a) is defined in a manner similar to the gross debt service ratio. It takes the annual mortgage payments in year t of a mortgage of <u>average</u> value in year s (the origination year), deflates by the <u>average</u> family income (Table 5) and adds to this ratio property taxes as a proportion of income (τ--see Table 7). While this is something like the average gross debt service ratio it differs in nature. Simply put, if g = m/y, it does not follow that the average value of g is the ratio of the average m to the average y. Thus the levels of the values in the G matrix are not of

much direct use. However, moving along a row of the G matrix with t varying (s and a fixed) tells us how the gross debt service ratio of a family with an average mortgage and an average family income would change. We can use this information as a mechanism to move the whole distribution of gross debt service ratios, defined earlier by the G_i values.

Specifically, we first adjust the G matrix to a level that we believe is appropriate. This adjustment is made as follows. For the year 1981, we calculate the average gross debt service ratio ($\bar{G}$) for new mortgages from the data in Table 3 and compare it to G(1981,1981,a), the calculated value of mean mortgage payments over mean income (plus τ) from the G matrix. We then adjust the G matrices (one for each value of a) by the ratio $\bar{G}/G(1981,1981,a)$. Once we have the level of the G matrices correct, we can use the detailed information on the distribution of gross debt service ratios to estimate how various points on the distribution will move through time as mortgages are repaid, and as incomes grow.

We provide two options in the SCRAM program. The first is a multiplicative option that takes as a parameter the ratio $G_i/\bar{G}$. That is, it assumes, say, that the 90^{th} percentile is always $(G_{90}/\bar{G})$ times the mean. This view leads to the adjustment equation

$$(8) \qquad G_i(s,t,a) = G(s,t,a) \cdot \left(\frac{\bar{G}}{G(1981,1981,a)}\right) \cdot \left(\frac{G_i}{\bar{G}}\right)$$

or,

$$G_i = G(s,t,a) \cdot \left(\frac{G_i}{G(1981,1981,a)}\right)$$

The second is to treat the difference between G_i and $\bar{G}$ as a parameter, which

leads to the additive adjustment formula

$$(9) \qquad G_i(s,t,a) = G(s,t,a) \cdot \left(\frac{\bar{G}}{G(1981,1981,a)}\right) + (G_i - \bar{G})$$

The final two steps in the SCRAM program are to calculate the numbers of mortgages eligible for subsidy and the value of the subsidy (on the assumption that all payments in excess of the eligibility criterion are subsidized). To make the first calculation, a value of the eligibility criterion, G*, must be chosen. Suppose it is 30 percent. Next find the value of i such that

$$(10) \qquad G_i(s,t,a) \leq G^* \leq G_{i+1}(s,t,a)$$

That is, find where G* lies on the distribution relative to the percentile points that are known. Suppose, for example, the 95th and 96th percentiles have values of G (for some s,t, and a) of 29.5 and 30.2. G* = 30.0 clearly lies in this range. Next, linearly interpolate to find F(G*(s,t,a)), the proportion below 30 percent. Then, 1-F(G*(s,t,a)) is the proportion of homeowners with characteristics (s,t,a) above the critical value. The total number of homeowners renewing in year t with values of G above G* is thus:

$$(11) \qquad N^* = \sum_a \sum_s [1-F(G^*(s,t,a))] \cdot R(s,t,a).$$

Finally, to find the average dollar amount by which the mortgage payments and taxes (i.e., gross debt service) of homeowners exceed the critical value requires an assumption concerning the incomes of those individuals receiving subsidy.[6] If we assume that all families eligible for subsidy in year t have incomes of $\bar{Y}^s$ in year t, then the calculation is straightforward, given $G_i(t,s,a)$. This is the assumption we make, and we allow the user to

choose the assumed income level by specifying it as a fraction of average personal income (the standard option in the program is 1.0).

Some Cautionary Notes

There are a number of features of the SCRAM program that should be brought to the user's attention. We list these in point form as follows:

1) The original aim of this project was to provide 2- to 5-year forecasts. The program has been written to allow forecasts to the year 2000, but one should attach less credibility to results beyond the five year horizon.

2) In the construction of SCRAM we have been limited in many aspects by data availability. The most obvious one is the lack of regional data. For example, we have been forced to use the Canada gross debt service ratio distribution (Table 3), the Canada distribution of amortization periods (Table 8), and the Canada distribution of mortgage terms (Table 2) for all regions. As a consequence, one should view the regional results as more tentative than the Canada results.

3) There is limited information available on the joint distribution of mortgages and incomes. Consequently, we have been forced to work with the distribution of the ratio of mortgage payments to income. More information on the joint distribution could prove helpful. Further to this point, there appears to be no information, even at a single point in time, about the distribution of gross debt service ratios at the time of mortgage renewal. Thus we have no benchmark against which to compare our results. Even a single benchmark would allow for better scaling of the distribution at renewal time.

4) As made clear in the introduction, the SCRAM program does not incorporate any behavioural responses. This was the intent from the outset. Even with a much larger project it is not clear that enough information would have been available to allow more than quite crude parameterization. One can, perhaps, accomplish as much by a careful selection of input data. An example of this is the conditional forecasts of mortgage terms and loan approvals.

FOOTNOTES

1. It is assumed here that at a mortgage renewal date, the family's income and mortgage obligations would be calculated and the family would be ruled eligible or ineligible for the subsidy for some fixed period of time -- say one year, or for the new term of the mortgage.
2. For example, they could make lower down payments and use the savings to help with payments in the first term of the mortgage.
3. For new construction the builder often chooses the initial term of the mortgage. However, if there is a demand for shorter-term mortgages, some market response to supply such terms might be expected.
4. By inputs here, we mean data that are needed by the model, not those which are required to control each simulation.
5. If the plan were to apply only to NHA and conventional mortgages, an incentive would be created for a larger fraction of mortgages to be of these sorts. Again, adjustments may be needed.
6. This calculation was not a part of the original project, which asked only that the number of eligible renewals be calculated; however, this calculation has been added at the request of C.M.H.C.

TABLE 1: ESTIMATES OF NHA AND CONVENTIONAL NEW AND EXISTING INSTITUTIONAL LOAN APPROVALS (IN THOUSANDS OF DOLLARS) FOR HOMEOWNERSHIP HOUSING, 1970 TO 1982 AND FORECASTS CONDITIONAL ON ASSUMED INTEREST RATE

	Historical Data -- 1970 to 1982					
Year	British Columbia	Prairie	Ontario	Quebec	Atlantic	Total
1970	16,800	15,200	50,300	12,400	10,300	105,000
1971	27,300	27,900	79,000	26,200	13,600	174,000
1972	32,200	33,300	90,800	28,600	16,100	201,000
1973	43,300	41,000	109,500	30,300	21,900	246,000
1974	31,600	35,000	80,100	28,700	14,600	190,000
1975	38,500	46,800	112,300	37,700	15,700	251,000
1976	39,000	51,400	109,200	43,500	17,900	261,000
1977	44,300	67,400	149,500	46,900	23,900	332,000
1978	38,500	71,600	133,500	49,400	23,200	316,200
1979	48,300	64,000	117,900	46,400	22,400	299,000
1980	49,200	41,400	71,600	36,500	14,300	213,000
1981	22,500	28,000	55,400	28,800	7,300	142,000
1982	20,000	38,000	62,000	30,000	10,000	160,000
	Conditional Forecasts -- 1983 to ---					
Interest rate	British Columbia	Prairie	Ontario	Quebec	Atlantic	Total
13%	35,000	45,000	80,000	43,000	17,000	220,000
14	33,000	42,000	76,000	40,000	16,000	207,000
15	31,000	39,000	72,000	37,000	15,000	194,000
16	29,000	36,000	68,000	34,000	14,000	181,000
17	27,000	33,000	64,000	31,000	13,000	168,000
18	25,000	30,000	60,000	28,000	12,000	155,000
19	23,000	27,000	56,000	25,000	11,000	142,000
20	21,000	24,000	52,000	22,000	10,000	129,000
21	19,000	21,000	48,000	19,000	9,000	116,000

SOURCE: C.M.H.C.

TABLE 2: DISTRIBUTION OF MORTGAGE TERMS

	Historical Data -- 1970 to 1982						
	Mortgage Origination				Mortgage Renewal		
	1-Year	3-Year	5-Year	Fixed	1-Year	3-Year	5-Year
1970	0.00	0.00	0.75	0.25	0.00	0.00	1.00
1971	0.00	0.00	0.80	0.20	0.00	0.00	1.00
1972	0.00	0.00	0.85	0.15	0.00	0.00	1.00
1973	0.00	0.00	0.90	0.10	0.00	0.00	1.00
1974	0.00	0.05	0.90	0.05	0.00	0.00	1.00
1975	0.00	0.10	0.87	0.03	0.00	0.00	1.00
1976	0.00	0.11	0.87	0.02	0.00	0.00	1.00
1977	0.00	0.12	0.86	0.02	0.00	0.00	1.00
1978	0.00	0.13	0.85	0.02	0.00	0.00	1.00
1979	0.03	0.14	0.83	0.00	0.00	0.10	0.90
1980	0.10	0.16	0.74	0.00	0.08	0.15	0.77
1981	0.22	0.27	0.51	0.00	0.29	0.33	0.38
1982	0.27	0.36	0.37	0.00	0.34	0.40	0.26

	Conditional Forecasts -- 1983 to ---						
	Origination Term by Interest Rates				Renewal Term by Interest Rates		
	1-Year	3-Year	5-Year	Fixed	1-Year	3-Year	5-Year
13%	0.07	0.13	0.80	0.00	0.00	0.00	1.00
14	0.10	0.15	0.75	0.00	0.00	0.00	1.00
15	0.14	0.19	0.67	0.00	0.00	0.21	0.79
16	0.19	0.25	0.56	0.00	0.22	0.28	0.50
17	0.25	0.33	0.42	0.00	0.29	0.36	0.35
18	0.33	0.37	0.30	0.00	0.37	0.39	0.24
19	0.35	0.41	0.24	0.00	0.40	0.40	0.20
20	0.37	0.45	0.18	0.00	0.43	0.38	0.19
21	0.39	0.49	0.12	0.00	0.47	0.35	0.18

SOURCE: C.M.H.C.

TABLE 3: 1981 GROSS DEBT SERVICE RATIO DISTRIBUTION

Gross Debt Service Ratio*	Percentage Distribution	Cumulative Distribution
0 - 15%	9.7	9.7
15 - 17	5.1	14.8
17 - 20	13.9	28.7
20 - 23	19.5	48.2
23 - 26	19.2	67.4
26 - 29	16.5	83.9
29 - 32	9.5	93.4
32 - 35	3.8	97.2
35 - 38	1.2	98.4
38 - 41	1.0	99.4
41 - 44	.4	99.8
44 - 47	.1	99.9
47 - 50	.1	100.0

*Intervals are defined as 17.06-20.05, 20.06-25.05, etc.

SOURCE: C.M.H.C.

TABLE 4: AVERAGE FAMILY INCOMES OF NHA BORROWERS FOR NEW HOUSING, 1970-1982 (CURRENT DOLLARS)

Year	British Columbia	Prairie	Ontario	Quebec	Atlantic	Canada
1970	11525	10119	12718	9860	8461	10969
1971	12461	11197	13549	10612	9111	11819
1972	13513	12046	14536	11547	10044	12774
1973	14827	13695	15405	12400	10869	13807
1974	15961	14980	16422	13562	11882	14923
1975	16933	16824	17484	14711	13021	16129
1976	18494	17810	18812	16209	13977	17433
1977	21548	20175	21582	18543	15997	19978
1978	24781	23351	24614	21246	18254	22894
1979	28589	27227	28002	24295	20772	26236
1980	32969	31385	31933	28049	23116	30066
1981	39020	39399	39169	33741	28371	36712
1982	42277	42687	42438	36557	30739	39776

SOURCE: C.M.H.C. data with adjustments based on data from Statistics Canada 13-201 (see text).

TABLE 5: ESTIMATED AVERAGE VALUE OF NHA AND CONVENTIONAL NEW LOANS, 1970-1982 (IN THOUSANDS OF DOLLARS)

Year	British Columbia	Prairie	Ontario	Quebec	Atlantic	Canada
1970	19.6	18.4	19.5	12.0	13.6	17.2
1971	20.9	19.6	20.8	12.8	14.5	18.3
1972	23.1	21.6	23.0	14.1	16.0	20.2
1973	28.3	26.4	28.1	17.2	19.6	24.7
1974	32.4	30.2	32.2	19.7	22.4	28.3
1975	36.6	34.1	36.4	22.3	25.3	32.0
1976	39.8	40.3	39.2	24.8	28.4	35.4
1977	39.3	41.8	38.7	25.8	30.3	36.4
1978	41.7	47.5	41.2	27.5	31.4	39.3
1979	46.8	54.3	44.7	30.4	33.5	43.6
1980	58.5	61.7	47.5	29.2	36.5	47.1
1981	66.0	67.0	50.8	37.0	36.0	52.3
1982	71.5	72.6	55.0	40.1	39.0	56.7

SOURCE: Based on data provided by C.M.H.C., as described in text.

TABLE 6: HYPOTHETICAL DISTRIBUTIONS OF THE LIFE OF A TWENTY-FIVE YEAR MORTGAGE

Year	Distribution A (1)		Distribution B (2)	
	Frequency	Cumulative Frequency	Frequency	Cumulative Frequency
1	0.002	0.002	0.011	0.011
2	0.003	0.005	0.013	0.024
3	0.005	0.010	0.017	0.041
4	0.008	0.018	0.023	0.064
5	0.012	0.030	0.031	0.095
6	0.017	0.047	0.041	0.136
7	0.023	0.070	0.053	0.189
8	0.030	0.100	0.067	0.256
9	0.038	0.138	0.083	0.339
10	0.047	0.185	0.101	0.440
11	0.057	0.242	0.105	0.545
12	0.068	0.310	0.091	0.636
13	0.080	0.390	0.078	0.714
14	0.093	0.483	0.066	0.780
15	0.082	0.565	0.055	0.835
16	0.072	0.637	0.045	0.880
17	0.063	0.700	0.036	0.916
18	0.055	0.755	0.028	0.944
19	0.048	0.803	0.021	0.965
20	0.042	0.845	0.015	0.980
21	0.037	0.882	0.010	0.990
22	0.033	0.915	0.006	0.996
23	0.030	0.945	0.003	0.999
24	0.028	0.973	0.001	1.000
25	0.027	1.000	0.000	1.000

(1) Assumed to prevail during 1970 to 1979. Median life is 14.2 years and weighted mean life is slightly less than 15 years.

(2) Assumed to prevail from 1980 and beyond. Median life is 10.5 years and weighted mean life is 11.2 years.

SOURCE: C.M.H.C.

TABLE 7: PROPERTY TAXES AS A PERCENT OF PERSONAL INCOME

British Columbia	4.79
Prairie	4.36
Ontario	4.51
Quebec	3.81
Atlantic	2.03
Canada	4.11

SOURCE: Calculated from information for 1977 on property taxes as a percent of personal income by province. The weights used to calculate regional and Canada rates were the 1976 Census, Family Household proportions.

TABLE 8: PERCENT DISTRIBUTION OF AMORTIZATION PERIODS FOR LOANS APPROVED FOR NEW HOUSING UNDER THE NHA (1971-1982)

Year	Amortization Period (years)			
	20	25	30	35
1971	1.8	81.3	14.5	2.8
1972	1.4	86.8	7.1	4.7
1973	1.4	85.9	5.1	7.6
1974	2.5	57.4	4.2	35.9
1975	1.9	49.1	5.5	43.5
1976	1.3	67.1	13.2	18.4
1977	2.0	70.2	14.1	13.7
1978	3.0	75.0	14.3	7.7
1979	5.3	79.2	10.5	5.0
1980	10.7	80.0	7.5	1.8
1981	14.8	76.5	7.0	1.7
1982	41.4	56.5	2.0	0.1

NOTES: 20 year is reported as 0-24.
25 year includes 26-29 (which is less than 0.3% when reported separately).
30 year includes 30-34 (which is less than 0.2% when reported separately).
35 year includes 36-40 (which is less than 0.1% when reported separately).

SOURCE: Based on Canadian Housing Statistics, 1981, Table 88 and 1982, Table 86.

TABLE 9: CONVENTIONAL MORTGAGE LENDING RATE, 1970-1982 (ANNUAL AVERAGE OF MONTHLY RATES)

1970	10.44
1971	9.43
1972	9.21
1973	9.59
1974	11.24
1975	11.43
1976	11.78
1977	10.36
1978	10.60
1979	11.98
1980	14.32
1981	18.15
1982	17.89

SOURCE: Statistics Canada (CANSIM B14024).